In the Claims:

1. (Currently Amended) A method for measuring a cardiac performance parameter, the method comprising **repeating over a series of two or more consecutive heart cycles**:

   causing a change in at least one of volume and pressure in a heart chamber at a selected time during a heart cycle;

   measuring a change in at least one characteristic of the heart chamber which occurs in response to the change in at least one of volume and pressure; and

   calculating at least one cardiac performance parameter based on a ratio of the measured change in the characteristic to the caused change.

2. (Original) A method as in claim 1, wherein causing the change comprises introducing a volume of fluid into the heart chamber during diastole.

3. (Original) A method as in claim 2, wherein introducing the volume of fluid comprises releasing the fluid within the heart chamber via one or more apertures in a catheter positioned in the chamber.

4. (Original) A method as in claim 2, wherein introducing the volume of fluid comprises inflating an expandable balloon coupled with a catheter positioned in the heart chamber.

5. (Original) A method as in claim 4, wherein inflating the balloon comprises: inflating the balloon during systole of the heart; and deflating the balloon during diastole of the heart immediately following the systole.

6.   (Original)   A method as in claim 4, wherein inflating the balloon comprises: inflate the balloon during diastole of the heart; and deflating the balloon during systole of the heart immediately following the diastole.

7.   (Original)   A method as in claim 2, wherein introducing the volume of fluid comprises: inflating a balloon within the heart chamber during systole; deflating the balloon during diastole immediately following the systole; and releasing an amount of fluid within the heart chamber during the diastole.

8.   (Original)   A method as in claim 7, wherein the balloon is deflated by a volume equal to the amount of the released fluid.

9.   (Original)   A method as in claim 7, wherein the balloon is deflated by a volume greater than the amount of the released fluid.

10.   (Original)   A method as in claim 1, wherein causing the change comprises activating a hydrophone at least once during diastole.

11.   (Original)   A method as in claim 10, wherein activating comprises activating the hydrophone at a frequency of about 200 Hz.

12.   (Original)   A method as in claim 10, wherein activating comprises activating the hydrophone at a frequency of about 500 Hz.

13.   (Original)   A method as in claim 10, wherein activating comprises activating the hydrophone at a frequency of about 1000 Hz.

14.   (Original)   A method as in claim 1, wherein causing the change comprises inducing a paroxysmal ventricular contraction.

15.   (Original)   A method as in claim 14, wherein the paroxysmal ventricular contraction is induced by electrical stimulation.

16.   (Original)   A method as in claim 1, further comprising measuring the heart cycle using an electrocardiogram device, wherein the selected time during the heart cycle is selected using the electrocardiogram measurement.

17.   (Original)   A method as in claim 1, further comprising measuring the heart cycle using at least one sensor on a catheter positioned in the heart chamber, wherein the selected time during the heart cycle is selected using the sensor measurement.

18.   (Original)   A method as in claim 1, wherein the change in the cardiac characteristic is measured immediately after causing a change in at least one of volume and pressure.

19.   (Original)   A method as in claim 1, wherein the change in the cardiac characteristic is measured during at least a portion of the heart cycle after the change in at least one of the volume and pressure.

20.   (Cancelled)

21.   (Original)   A method as in claim 1, wherein measuring the change comprises measuring a change in at least one pressure within the heart chamber.

22.   (Original)   A method as in claim 21, wherein measuring the change in pressure comprises measuring a change in end-diastolic pressure and a change in end-systolic pressure.

23.   (Original)   A method as in claim 22, wherein calculating the at least one parameter comprises calculating a cardiac pressure gain, comprising: calculating a first difference between a first end-systolic pressure and a second end-systolic pressure; calculating a second difference between a first end-diastolic pressure and a second end-diastolic pressure; and dividing the first difference by the second difference.

24.   (Original)   A method as in claim 23, further comprising providing at least one of the end-diastolic pressures, the end-systolic pressures and the cardiac pressure gain for display on a display device.

25.   (Original)   A method as in claim 24, wherein the providing step comprises providing data in the form of a plot, with at least one end-diastolic pressure on one axis of the plot and at least one end-systolic pressure on a perpendicular axis of the plot.

26.   (Original)   A method as in claim 21, wherein measuring the change comprises measuring a change in left ventricular end-diastolic pressure and a change in left ventricular end-systolic pressure.

27.   (Original)   A method as in claim 1, wherein measuring the change comprises measuring a change in at least one volume within the heart chamber.

28.   (Original)   A method as in claim 27, wherein measuring the change comprises measuring a change in end-diastolic volume and a change in end-systolic volume.

29.   (Original)   A method as in claim 28, wherein calculating the at least one parameter comprises calculating a volume reserve comprising: calculating a first difference between a first end-systolic volume and a second end-systolic volume;

calculating a second difference between a first end-diastolic volume and a second end-diastolic volume; and dividing the first difference by the second difference.

30. (Original) A method as in claim 29, further comprising providing at least one of the end-diastolic volumes, the end-systolic volumes and the volume reserve for display on a display device.

31. (Original) A method as in claim 30, wherein the providing step comprises providing data in the form of a plot, with at least one end-diastolic volume on one axis of the plot and at least one end-systolic volume on a perpendicular axis of the plot.

32. (Original) A method as in claim 28, wherein measuring the change comprises measuring a change in a left ventricular end-diastolic volume and a change in a left ventricular end-systolic volume.

33. (Original) A method as in claim 1, wherein measuring the change comprises measuring a change in at least one pressure and a change in at least one volume within the heart chamber.

34. (Original) A method as in claim 33, wherein measuring the change comprises measuring a change in end-diastolic volume and a change in end-diastolic pressure.

35. (Original) A method as in claim 34, further comprising providing pressure and volume data as a plot, with at least one volume on one axis of the plot and at least one volume on a perpendicular axis of the plot.

36. (Original) A method as in claim 34, wherein calculating the at least one parameter comprises calculating a lusitropic stiffness of the heart chamber, comprising:

calculating a first difference between a second end-diastolic pressure and a first end-diastolic pressure; calculating a second difference between a second end-diastolic volume and a first end-diastolic volume; and dividing the first difference by the second difference.

37.   (Original)   A method as in claim 36, further comprising providing at least one of the volumes, the pressures and the lusitropic stiffness for display on a display device.

38.   (Original)   A method as in claim 34, wherein calculating the at least one parameter comprises calculating a lusitropic compliance of the heart chamber, comprising: calculating a first difference between a second end-diastolic volume and a first end-diastolic volume; calculating a second difference between a second end-diastolic pressure and a first end-diastolic pressure; and dividing the first difference by the second difference.

39.   (Original)   A method as in claim 38, further comprising providing at least one of the volumes, the pressures and the lusitropic compliance for display on a display device.

40.   (Original)   A method as in claim 33, wherein measuring the change comprises measuring a change in end-systolic volume and a change in end-systolic pressure.

41.   (Original)   A method as in claim 40, further comprising providing volume and pressure data as a plot, with at least one volume on one axis of the plot and at least one volume on a perpendicular axis of the plot.

42.   (Original)   A method as in claim 40, wherein calculating the at least one parameter comprises calculating an inotropic stiffness of the heart chamber, comprising:

calculating a first difference between a second end-systolic pressure and a first end-systolic pressure; calculating a second difference between a second end-systolic volume and a first end-systolic volume; and dividing the first difference by the second difference.

43.   (Original)   A method as in claim 42, further comprising providing at least one of the volumes, the pressures and the inotropic stiffness for display on a display device.

44.   (Original)   A method as in claim 40, wherein calculating the at least one parameter comprises calculating an inotropic compliance of the heart chamber, comprising: calculating a first difference between a second end-systolic volume and a first end-systolic volume; calculating a second difference between a second end-systolic pressure and a first end-systolic pressure; and dividing the first difference by the second difference.

45.   (Original)   A method as in claim 44, further comprising providing at least one of the volumes, the pressures and the inotropic compliance for display on a display device.

46.   (Original)   A method as in claim 33, wherein the measuring and calculating steps comprise: continuously measuring a pressure and volume in the heart chamber during a heart cycle; calculating a first integral of the pressure as a function of volume as the volume increases due to expansion of the ventricle; calculating a second integral of the pressure as a function of volume as the volume decreases due to contraction of the ventricle; and calculating a myocardial work of the heart chamber by subtracting the second integral from the first integral.

47.   (Original)   A method as in claim 33, wherein the measuring and calculating steps comprise: continuously measuring a pressure and volume in the heart

chamber during a heart cycle; calculating a first integral of the product of the pressure and the volume as the volume increases due to expansion of the ventricle; calculating a second integral of the product of the pressure and the volume as the volume decreases due to contraction of the ventricle; and calculating a first moment of myocardial work of the heart chamber by subtracting the second integral from the first integral.

48.   (Original)   A method as in claim 46, further comprising: calculating a body surface are; and calculating a myocardial work index by dividing the myocardial work by the body surface area.

49.   (Original)   A method as in claim 46, further comprising: calculating a stroke ejection period by calculating the time when the velocity in the aorta begins to increase from zero to the time when the velocity in the aorta first returns to zero; and calculating a myocardial power by dividing the myocardial work by the stroke ejection period.

50.   (Original)   A method as in claim 49, further comprising calculating a body surface area; and calculating a myocardial power index by dividing myocardial power by body surface area.

51.   (Original)   A method as in claim 49, further comprising calculating a stroke volume; and calculating a myocardial power requirement parameter by dividing myocardial power by stroke volume.

52.   (Original)   A method as in claim 46, further comprising: calculating a first myocardial work for the first heart cycle; changing the end-diastolic volume and pressure; calculating a second myocardial work for a second heart cycle; measuring a first end-diastolic pressure for the first heart cycle and a second end-diastolic pressure for the second heart cycle; and calculating a myocardial reserve by dividing a difference

11

between the second and first myocardial works by a difference between the second and the first end-diastolic pressures.

53.   (Original)   A method as in claim 52, further comprising: calculating a body surface area; and calculating a myocardial reserve index by dividing the myocardial reserve by the body surface area.

54.   (Original)   A method as in claim 46, wherein the myocardial work is calculated for a left ventricle of a heart.

55.   (Original)   A method as in claim 46, wherein the myocardial work is calculated for a right ventricle of a heart.

56.   (Original)   A method as in claim 46, further comprising: calculating a first myocardial power for the first heart cycle; changing the end-diastolic volume and pressure; calculating a second myocardial power for a second heart cycle; measuring a first end-diastolic pressure for the first heart cycle and a second end-diastolic pressure for the second heart cycle; and calculating a myocardial power reserve by dividing a difference between the second and first myocardial powers by a difference between the second and the first end-diastolic pressures.

57.   (Original)   A method as in claim 56, further comprising: calculating a body surface area; and calculating a myocardial power reserve index by dividing the myocardial power reserve by the body surface area.

58.   (Original)   A method as in claim 1, further comprising: measuring a change in at least one flow rate of blood flowing out of the heart chamber which occurs in response to the volume and/or pressure change; and calculating at least one flow-related parameter of the heart chamber based on a ratio of the measured change in the flow rate to the volume and/or pressure change.

12

59.   (Original)   A method as in claim 58, wherein measuring the change in the flow rate comprises measuring at least one flow rate in an aorta.

60.   (Original)   A method as in claim 58, wherein measuring the change in the flow rate comprises measuring at least one flow rate in at least one pulmonary artery.

61.   (Original)   A method as in claim 58, wherein calculating the flow-related parameter comprises calculating at least one stroke volume of a heart from which the flow rate is measured, the method further comprising: estimating a cardiac output for the heart; measuring a rate of the heart; calculating a first ratio by dividing the estimated cardiac output by the heart rate; calculating a first integral of the flow rate over a number of heart cycles; calculating a second ratio by dividing the integral by the number of heart cycles; calculating a scaling factor by dividing the first ratio by the second ratio; calculating a second integral of the flow rate over a selected heart cycle; and calculating the stroke volume by multiplying the second integral by the scaling factor.

62.   (Original)   A method as in claim 61, further comprising: measuring a body surface area; and calculating a stroke volume index by dividing the stroke volume by the body surface area.

63.   (Original)   A method as in claim 61, wherein the cardiac output is estimated using at least one of Fick's method and a dilution method.

64.   (Original)   A method as in claim 61, further comprising determining a calculated cardiac output by dividing the stroke volume by a time of duration of one of the heart cycles.

65.   (Original)   A method as in claim 64, further comprising: measuring a body surface area; and calculating a cardiac index by dividing the calculated cardiac output by the body surface area.

66.   (Original)   A method as in claim 64, further comprising: determining a first calculated cardiac output and a second calculated cardiac output for first and second heart cycles; measuring first end-diastolic pressure and a second end-diastolic pressure for the first and second heart cycles; and calculating a cardiac reserve by dividing a difference between the second and first calculated cardiac outputs by a difference between the second and first end-diastolic pressures.

67.   (Original)   A method as in claim 66, further comprising: measuring a body surface area; and calculating a cardiac reserve index by dividing the calculated cardiac reserve by the body surface area.

68.   (Original)   A method as in claim 61, further comprising: calculating a first stroke volume and a second stroke volume for first and second cardiac cycles; measuring first end-diastolic pressure and a second end-diastolic pressure for the first and second heart cycles; and calculating a stroke reserve by dividing a difference between the second and first calculated stroke volumes by a difference between the second and first end-diastolic pressures.

69.   (Original)   A method as in claim 68, further comprising: measuring a body surface area; and calculating a stroke reserve index by dividing the calculated stroke reserve by the body surface area.

70.   (Original)   A method as in claim 61, further comprising: measuring an average systolic pressure in at least one outflow artery adjacent the heart; measuring an average diastolic pressure in the heart chamber; calculating a difference between

14

the average systolic pressure and the average diastolic pressure; and calculating a stroke work by multiplying the difference by the stroke volume.

71. (Original) A method as in claim 70, further comprising: measuring a body surface area; and calculating a stroke work index by dividing the calculated stroke work by the body surface area.

72. (Original) A method as in claim 70, further comprising: calculating a first stroke work and a second stroke work for first and second cardiac cycles; measuring first end-diastolic pressure and a second end-diastolic pressure for the first and second heart cycles; and calculating a stroke work reserve by dividing a difference between the second and first calculated stroke works by a difference between the second and first end-diastolic pressures.

73. (Original) A method as in claim 72, further comprising: measuring a body surface area; and calculating a stroke work reserve index by dividing the calculated stroke work reserve by the body surface area.

74. (Original) A method as in claim 70, wherein the at least one outflow artery comprises an aorta.

75. (Original) A method as in claim 70, wherein the at least one outflow artery comprises at least one pulmonary artery.

76. (Original) A method as in claims 46 and 70, further comprising calculating a cardiac efficiency by dividing the stroke work by the myocardial work.

77. (Original) A method as in claim 61, further comprising: calculating a first stroke volume and a second stroke volume for first and second cardiac cycles; measuring first end-diastolic volume and a second end-diastolic volume for the first and

15

second heart cycles; and calculating a cardiac amplification by dividing a difference between the second and first calculated stroke volumes by a difference between the second and first end-diastolic volumes.

78.   (Original)   A method as in claim 61, further comprising calculating a first difference between a second product of volume and pressure and a first product of volume and pressure, said second volume and pressure measured shortly after the first; calculating a determination of the incremental stroke volume which is the product of the scaling factor and the integral of the velocity in the proximal artery between the first and second times; calculating the period of time between the first measurement and the second; calculating a third product between the incremental stroke volume and the period of time; and calculating an ejection contractility parameter by dividing the first difference by the third product.

Claims 79 - 87 (Cancelled)